Update on the MAD-X simulations for steady-state-loss (white noise) QT

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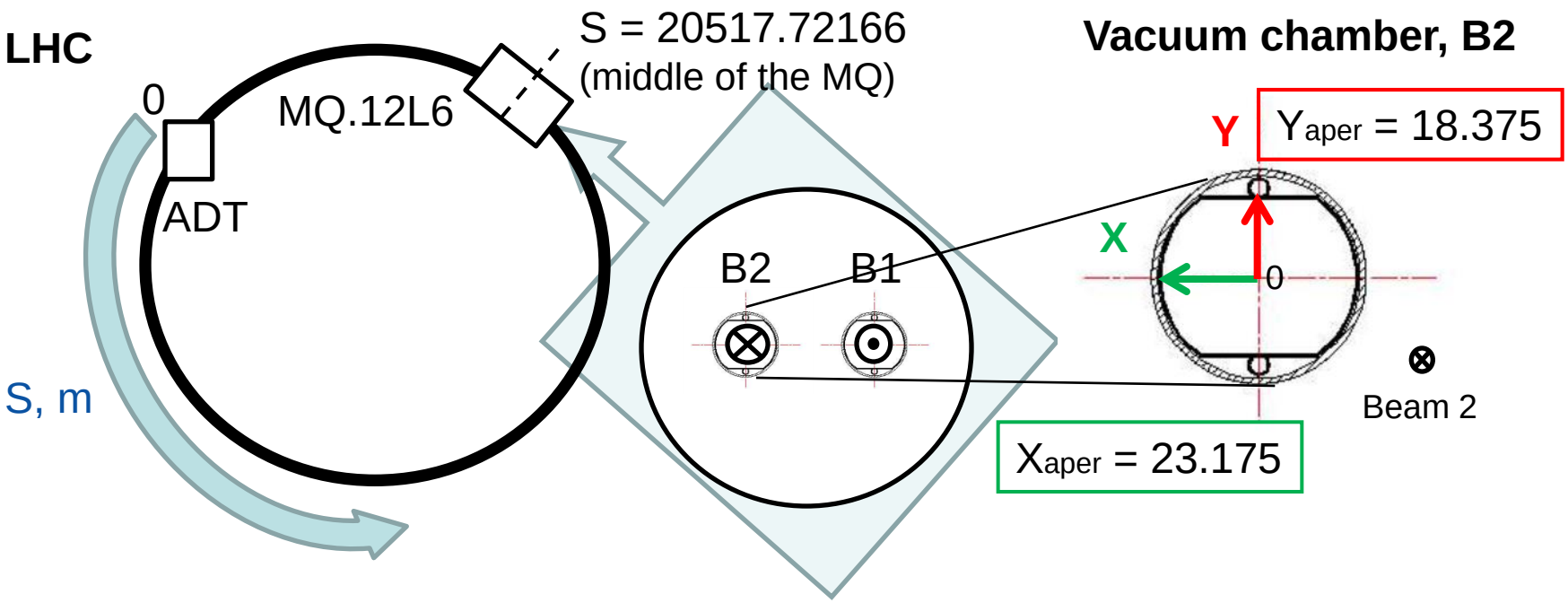
Coordinate system



Motivation

- Steady-state-loss quench test aimed to reproduce the quench limits for **continuous losses**
- Knowing the quench limits will allow **validating the simulation** codes (QP3 etc.).
- BLM thresholds should be increased to **avoid undesirable beam dumps**.

Experiment

Injecting 24 bunches to the LHC

Ramping to the nominal energy

Calibration of the beam-distance to aperture:
Increasing 3-corr. orbit bump until losses occur, then reducing the bump

Choosing the bunch:
Gating the ADT on 8 bunches
(bunch spacing 1250 ns, therefore ADT could distinguish separate bunches)

Excitation of the bunch:
Blowing up the gated bunches in the horizontal plane

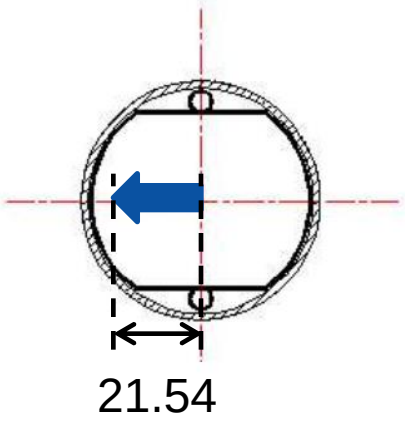
Simulations

Simulation parameters:

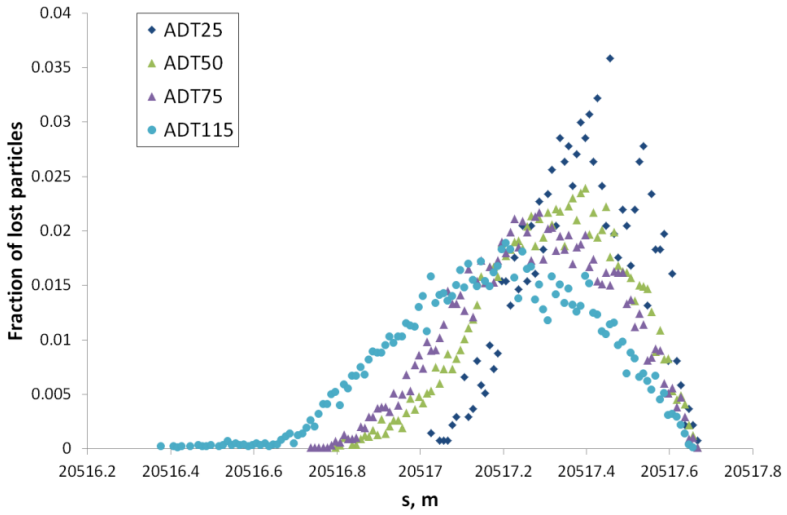
1 bunch at the LHC. Injection optics: β* are 11/10/11/10, Energy 4 TeV. Beam profile – from BWS measurements.

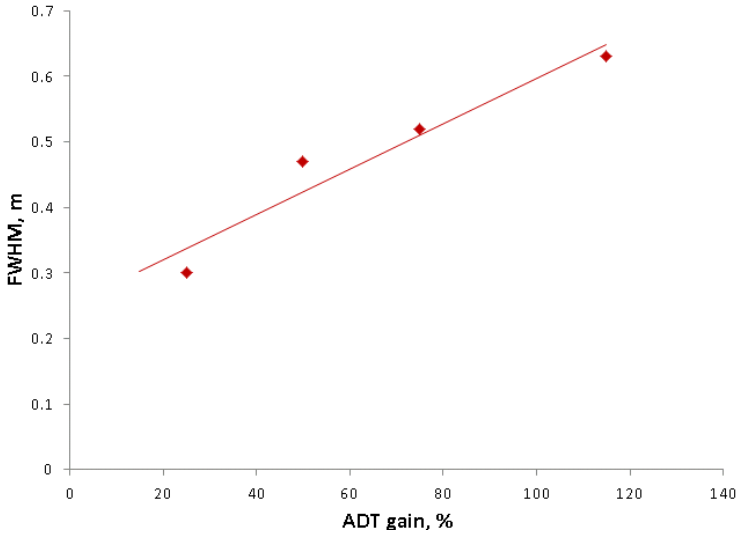
3-corr. orbit bump with an offset $4.3\sigma_{nom}$ from the beam screen (~21.54 mm from the centre of the BS)

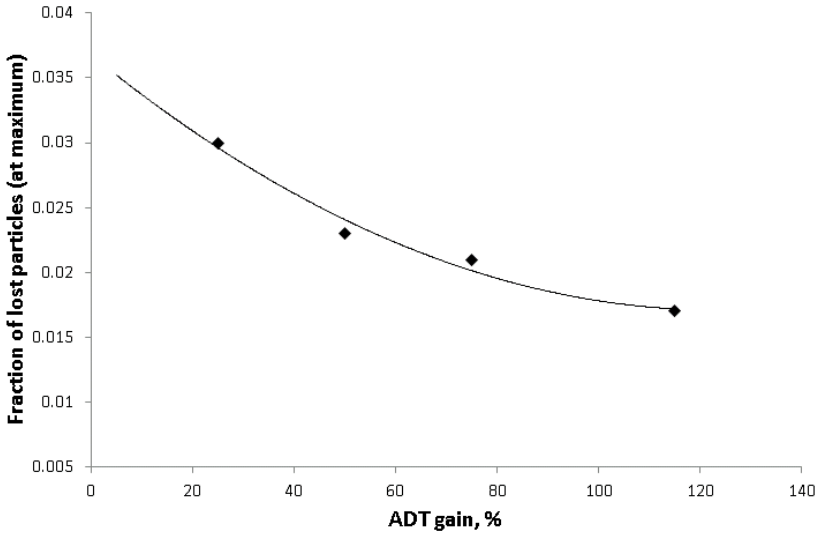
ADT excitation (random kick)



Dependence on ADT kick strength







Conclusion:

Decrease of ADT kick strength leads to

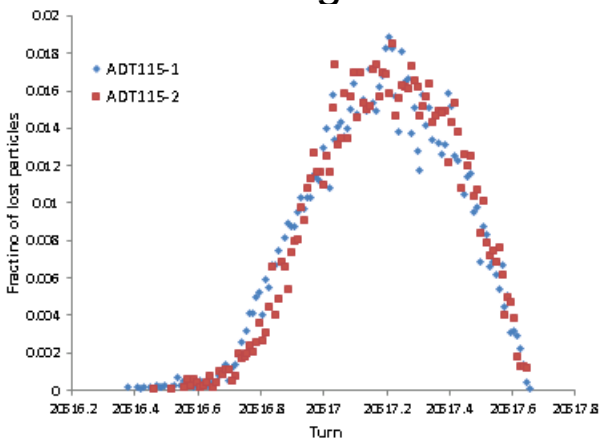
- compressing of longitudinal distribution

Dependence of time structure

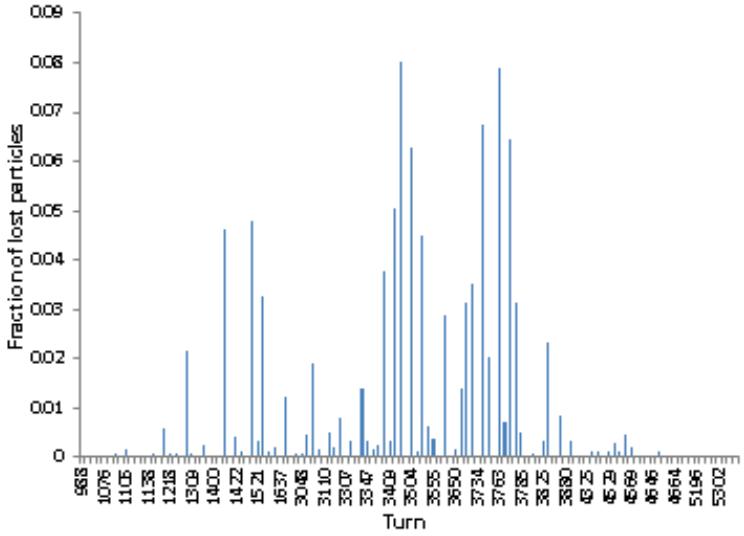
Conclusion:

Time structure strongly depends on the set of random numbers used (primary particle distribution and ADT kick)

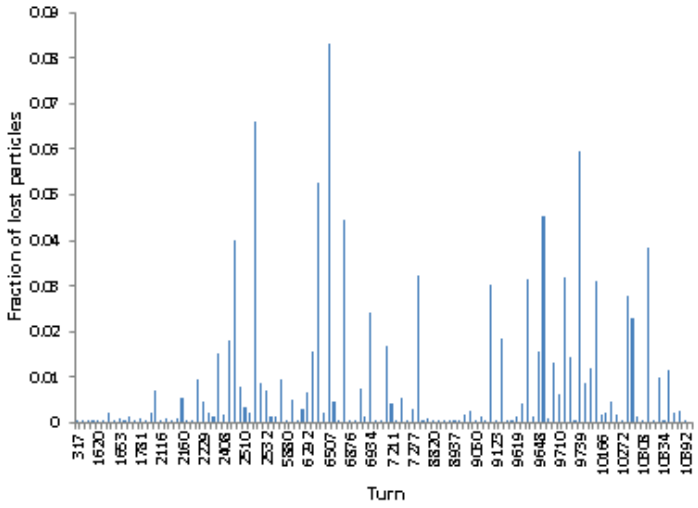
*ADT strength: 115 %



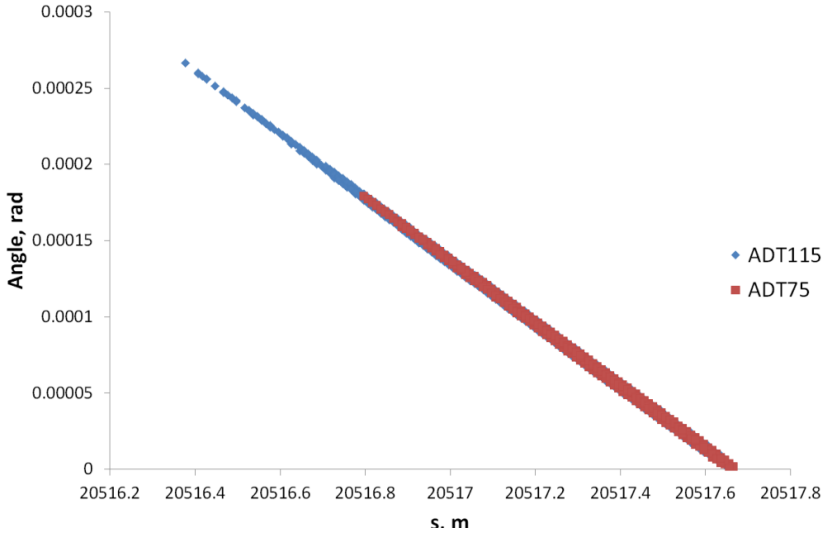
Total loss duration ~ 0.5 s

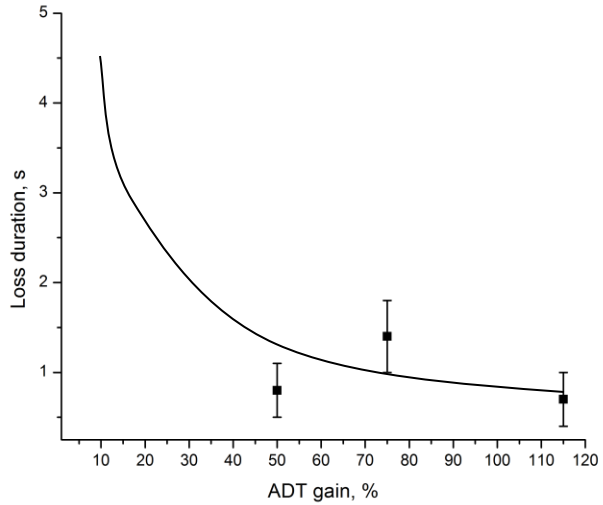


Total loss duration ~ 0.9 s



Dependency of impact angle and loss duration





Conclusion:

- Impact angle **depends only on magnetic field** and **not on excitation** scenario.

Conclusion:

Further simulations with lower ADT strength required

Conclusions

- Decrease of ADT kick strength leads to compressing of longitudinal distribution.
- Impact angle **depends only on magnetic field** and **not on excitation** scenario.
- Time structure strongly depends on the set of random numbers used.
- Further simulations with lower ADT strength required.